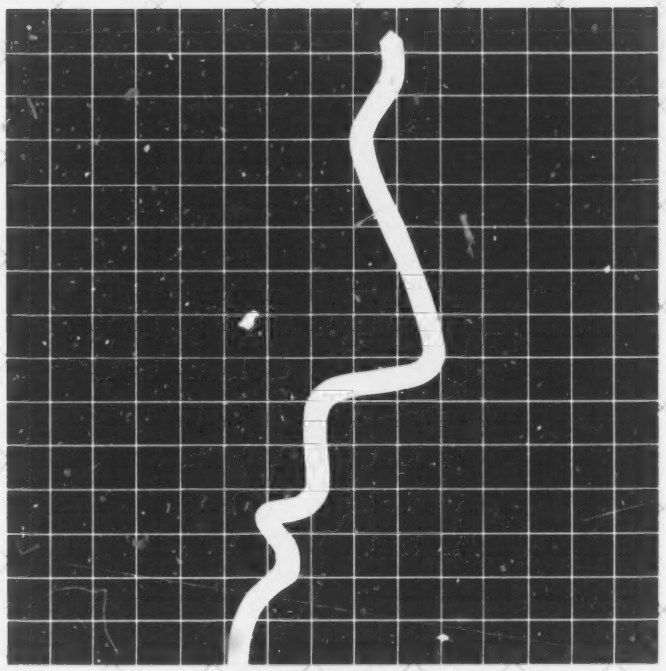
A8930-1 U 718



A PROFILE OF THE WOMAN ENGINEER

1984

SOCIETY OF WOMEN ENGINEERS

TABLE OF CONTENTS

INTRODUCTION 3

SUMMARY 3

EDUCATIONAL LEVEL AND DEGREE FIELDS 4

- Educational Level 4
- Degree Fields 4

EMPLOYMENT INFORMATION 5

- Current Status 5
- Type of Employer 6
- Product or Service 6
- Job Functions 7
- Supervisory Functions 7

SALARY INFORMATION 8

GENERAL CHARACTERISTICS 9

- Membership Grade 9
- Age of Members 10
- Marital Status and Children 10
- Registration and Technical Societies 10
- Geographical Location 10

APPENDIX I — Questionnaire 11

INTRODUCTION

This report is based on data obtained by surveying the non-student members of the Society of Women Engineers (SWE) during the winter of 1983-1984. The membership roll on January 19, 1984, showed 4,453 members in this category. This represents a sample of approximately 5% of the total population of women engineers in the United States.

The survey was answered by 2,112 of the qualified members. In previous years the number of responses was:

1984	2,112
1982	1,846
1979	1,318
1977	1,109
1974	462
1972	380

Conclusions are drawn here based, in part, on trends indicated by these past surveys.

All responses to the questionnaire were considered in the analysis of the data. Any woman with an engineering degree, holding state engineering registration as a professional engineer, or currently working in the engineering field was included. The latter group consisted mostly of individuals with degrees in mathematics, physics, chemistry, or other related science fields. The analysis included an insignificant 0.4% of responses from male members.

The questionnaire used for the survey is shown in the Appendix.

The Society of Women Engineers is the center for collection and distribution of information about women engineers in the United States. All requests for information should be addressed to:
Society of Women Engineers
United Engineering Center
Room 305
345 East 47th Street
New York, New York 10017 □

SUMMARY

This profile of the woman engineer is based on responses from 2,112 of the 4,453 women who were members of SWE at the time of the survey. The typical woman engineer described in this profile is about 27 years old, holds a Bachelor's degree in mechanical engineering, and lives on the West Coast of the United States. She works full time for a private industry in her field of specialization and is most likely to be married without children.

Since not all women engineers are typical, the following is a presentation of general differences and similarities obtained from the survey. The majority of the respondents (64%) have earned a Bachelor's degree from an accredited school. About 23% have continued their education to obtain a Master's degree, and 6% have acquired a doctorate. The Bachelor's degrees obtained were primarily in mechanical, chemical, civil, computer science, and electrical engineering. Those holding graduate degrees have most frequently chosen chemical engineering, electrical engineering, or education.

Eighty-six percent (86%) of the respondents were employed full time in engineering-related positions; only 3% were unemployed. Those remaining were employed part time (4%), employed full time in other areas (5%), or retired (2%). A large percentage of respondents were employed in a private industry. Areas of work responsibility, primary job function, and employer product or service were quite diverse. About half of the women engineers had no regular supervisory responsibility, while 2% served as general managers.

In general, the average salary of the woman engineer is less than that of the average engineer; and this is confirmed by two independent surveys— ERIC and AAES. However, the average salary for SWE respondents with 12 to 14 years since Bachelor's degree is slightly higher than the average engineer. Women engineers are young: 64% of the total sample were between the ages of 22 and 30.

As in previous surveys, more than half of the respondents were married. Also, more women engineers resided in California than in any other state. □

EDUCATIONAL LEVEL AND DEGREE FIELDS

The educational level of the woman engineer has been maintained about the same since the last survey. The degree fields have varied somewhat, reflecting overall trends in engineering technologies and their applications. □

EDUCATIONAL LEVEL

Of the women answering the survey, 76.3% received their Bachelor's degree in the last 10 years. This is to be expected since the majority of the respondents (64%) are between 22 and 30 years of age.

In response to the questions concerning highest degree earned, 14 respondents reported no degree and 11 had an associate degree. Those holding the Bachelor's degree totaled 63.7%; Master's degree, 23.3%; Master of Business Administration, 6.0%; and doctorate, 6.0%. □

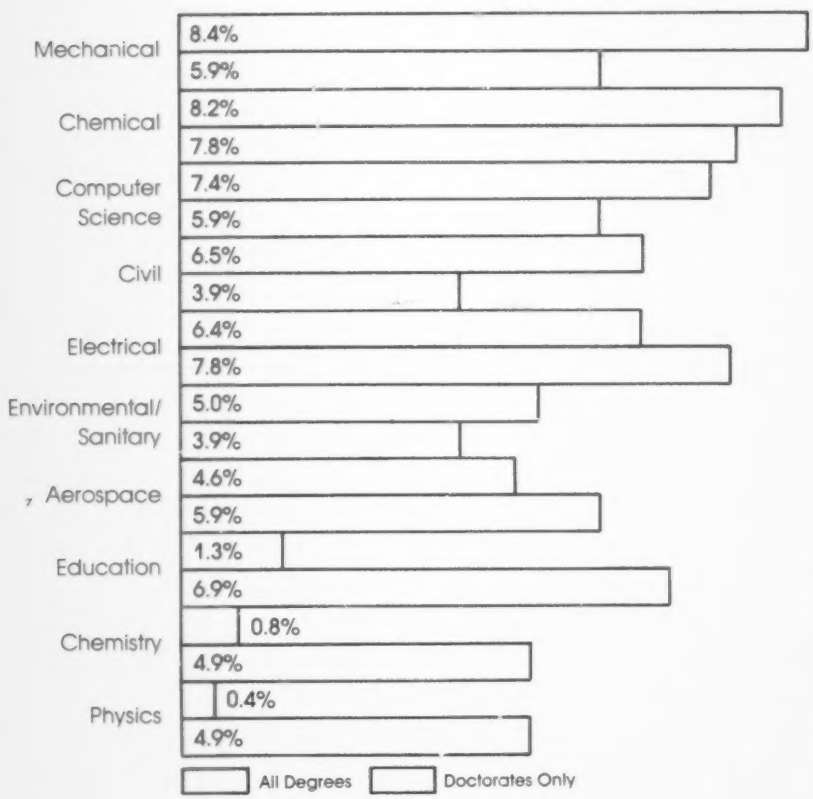
DEGREE FIELDS

Six fields of study, out of 36 possible answers, accounted for 46% of the Bachelor's degrees of women engineers. In order of selection these were:

Mechanical Engineering	9.9%
Chemical Engineering	8.9%
Computer Science/Engineering	7.6%
Civil Engineering	7.6%
Electrical Engineering	6.5%
Manufacturing Engineering	5.2%

Although mechanical engineering tops the list this year, it has dropped to about three-fourths of the percentage reported in 1982. The percentages for chemical, civil, and electrical engineering have dropped to one-half of the percentages reported in 1982. Counterbalancing these drops is an increase in the number of specialized fields, each accounting for less than 2% of the repondents. For the first time, computer science/engineering is in the top six fields. It has been growing since the 1979 survey, an increase that is consistent with the growth in the computer industry nationwide.

Women engineers holding doctorates have a slightly different distribution from those with other degrees. Exhibit 1 shows a comparison of disciplines for doctorates versus all degrees. Those with doctorates are most frequently found in chemical and electrical engineering, education, computer science, mechanical, and aerospace engineering. There has been a



FIELD OF SPECIALIZATION

EXHIBIT 1

noticeable increase in the number of doctorates in the very popular areas of mechanical and chemical engineering since the 1982 survey. Civil engineering had the largest increase, doubling its number. Metallurgical engineering fell back from its lead position to a category below 3%. Three categories—education, chemistry, and physics—have considerably more doctorates than lesser degrees.

Some of the main fields selected in the other degree categories also showed at the Master's level. Women in environmental, computer science, chemical, electrical, aerospace, and systems engineering more frequently had Master's degrees than did those in mechanical, civil, manufacturing, and industrial engineering.

Although traditional fields remain the backbone of U.S. industry and technology, they are losing their privileged position, giving way to more specialized fields. The tendency is clearly shown at the Master's degree level. In previous SWE surveys, the overall percentages of women engineers in traditional fields had increased. However, the statistics this year showed a significant drop in the overall percentage for traditional fields and an increase in the numbers for more specialized fields. This may be an indication that more women engineers are competing in specialized areas, or the new areas may be subsets of the traditional engineering fields. □

EMPLOYMENT INFORMATION

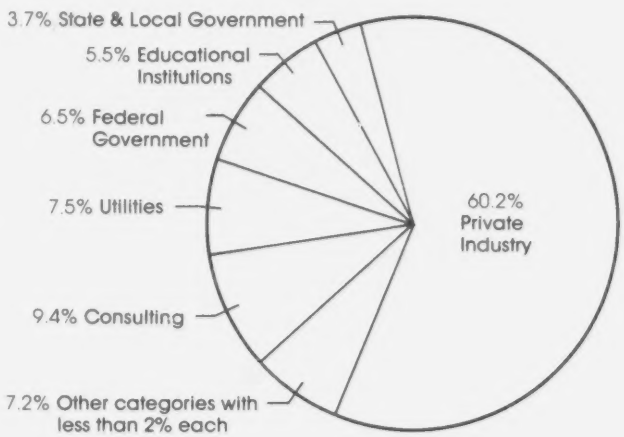
CURRENT STATUS

Eighty-six percent (86%) of the respondents to the survey reported that they were employed full time in an engineering-related position. Five percent (5%) were employed full time in non-engineering work, 2% were retired, and 3% were seeking employment.

Employment has essentially followed U.S. industry. Previous SWE surveys had shown lower employment when the economy was depressed. As the economic situation improved, employment for women engineers also improved. Employment is expected to swing with the economy, but to remain between 80% and 90%. □

TYPE OF EMPLOYER

The majority (60.2%) of the women engineers are employed by private industry. Consulting ranked second at 9.4%, followed by utilities at 7.4%. Exhibit 2 gives the percentage of responses for the different types of employers. □

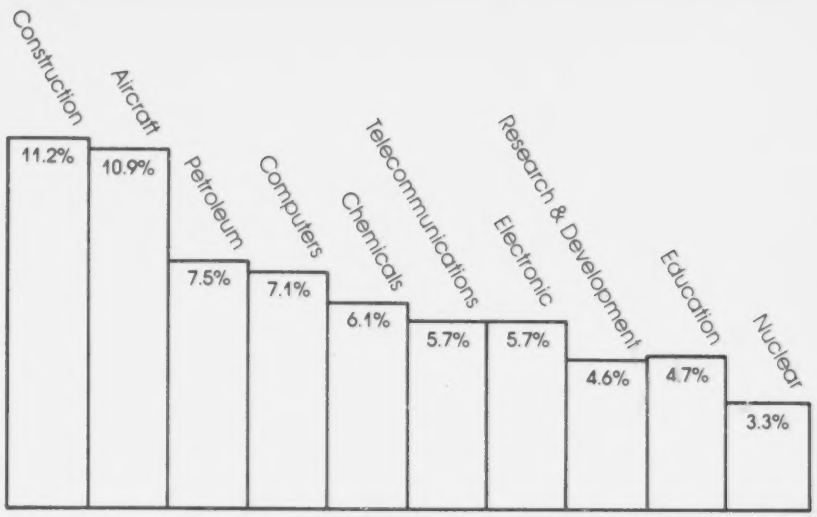


TYPE OF EMPLOYER

EXHIBIT 2

PRODUCT OR SERVICE

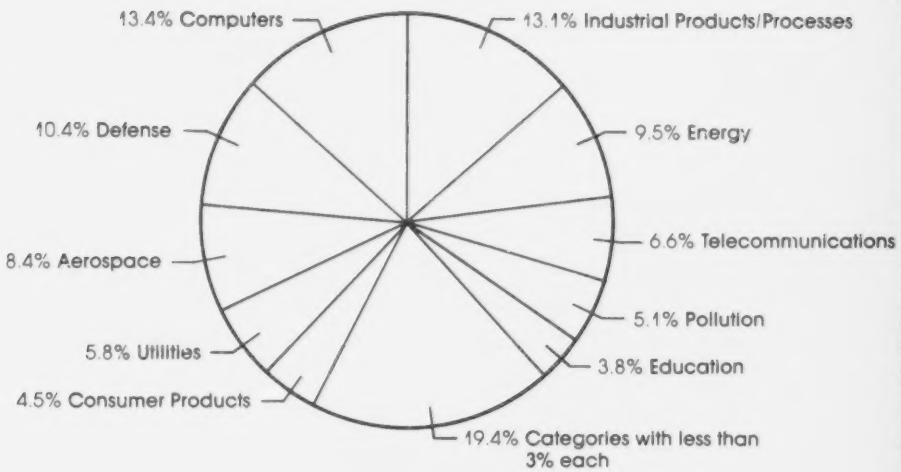
Respondents were allowed to give two answers about the product or service which best represented their employer. The results show construction/civil engineering and aircraft/spacecraft as the lead



Note: Other categories with less than 2% each accounted for 33.2% of the responses.

PRODUCT OR SERVICE AREA BEST DESCRIBING PRESENT EMPLOYER

EXHIBIT 3



AREA TO WHICH MAJOR PORTION OF WORK IS RELATED

EXHIBIT 4

services or products. Exhibit 3 gives other categories closely following these leaders.

The most frequently mentioned areas of work responsibility were computers and industrial products/processes, with 13.4% and 13.1%, respectively. In previous surveys, industrial products/processes accounted for about 20% of the responses. When the category "Computers" was added, it reduced the amount of responses for industrial product/processes to almost half of the expected amount. These were followed by defense and energy. Exhibit 4 gives additional information. □

JOB FUNCTIONS

Since as many as three answers were allowed to describe job function, the statistical information is not easily presented. The category most often selected was designing, closely followed by management, and then analysis and development. Staff supervision ranked fifth, followed by production, research, consulting, and planning together in a group. These were followed by administration and another group comprised of construction, teaching, and sales and service.

A total of 1,995 women responded to the question on principal job function. A second job function was given by 1,713 respondents. Only 1,315 gave a third function. A comparison of responses is presented in Exhibit 5. □

(n = total number of respondents)

JOB FUNCTIONS	PRINCIPAL n = 1,995	SECOND n = 1,713	THIRD n = 315
Design	17.5%	12.1%	6.4%
Management	15.7%	7.6%	5.9%
Analysis	12.3%	12.4%	6.4%
Development	9.9%	8.8%	7.4%
Staff Supervision	8.0%	4.7%	5.5%
Production	6.0%	2.7%	3.2%
Research	5.4%	5.5%	4.9%
Consulting	4.8%	7.1%	4.2%
Planning	4.6%	7.4%	9.2%
Administration	3.4%	6.1%	3.2%
Teaching	3.1%	2.2%	1.8%

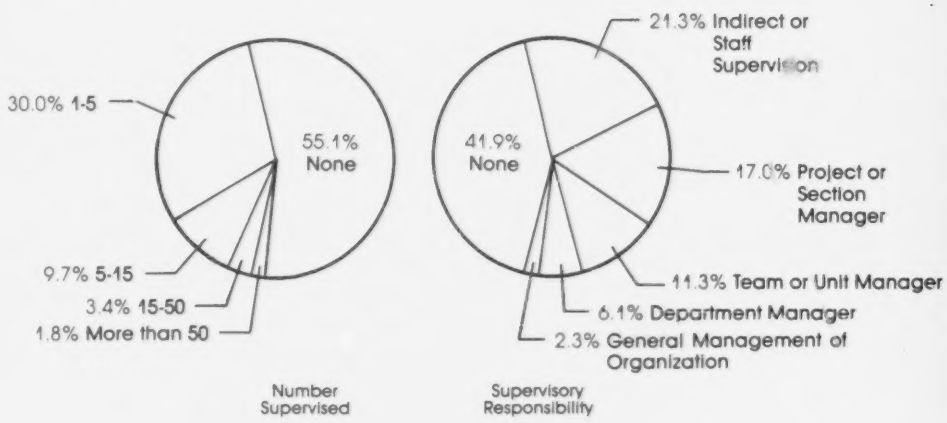
JOB FUNCTIONS

EXHIBIT 5

SUPERVISORY FUNCTIONS

Two similar questions were asked about supervisory functions, but the results do not correlate completely. (See Exhibit 6.) The first question concerned supervisory responsibility in terms of organization, such as supervision of project or section. The second question asked how many people were regularly supervised, such as 5 to 15 people.

To the first question, 41.9% said they gave no supervision, but 55.1% gave that answer for the second question. The mismatch was seen also at the "Management of a major department" level. It had 6.1% of the answers, while "Management of 15 to 50 people" had 3.4% of the answers. The answer of 2.3% to "General Management" correlated with the 1.8% who managed more than 50 people. The mismatch at the other supervisory levels may be due to individual definitions of supervisory categories. For example, women engineers may have technical supervisory responsibility such as project or task leader, but they may not have administrative supervisory responsibility for their team members. □



SUPERVISORY RESPONSIBILITY AND NUMBER SUPERVISED

EXHIBIT 6

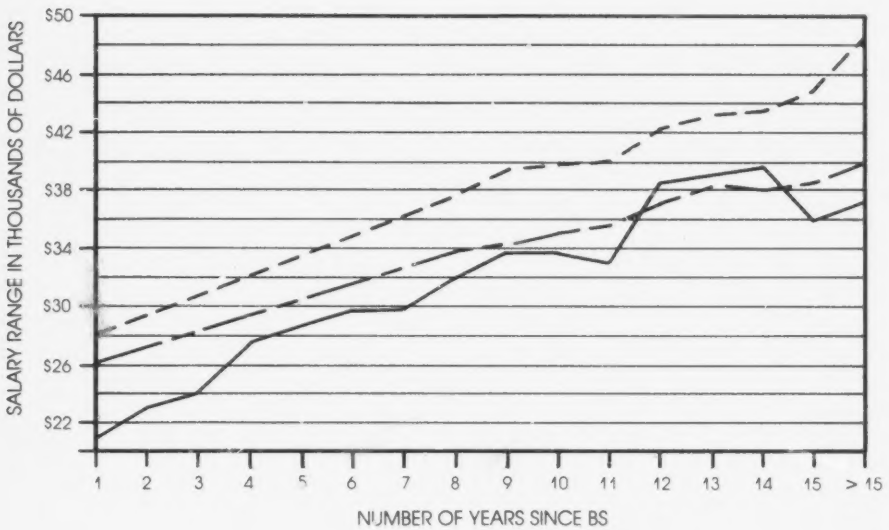
SALARY INFORMATION

The respondents were asked to report their net income including salary, commissions and bonuses, or fees related to their work. The survey showed that the average salary for women engineers has nearly doubled in the last decade. However, when today's earnings are compared with earnings for the total engineering community, women engineers in general earn less for their work. The differences may be due in part to being younger or to having lower levels of responsibility. The average woman engineer is 27 years old, three years younger than the average engineer, according to the Educational Resources Information Center (ERIC) report, a publication from the U.S. Department of Education, June 1983. Women have regularly reported low levels of responsibility. Women engineers with indirect supervisory responsibility or without direct supervisory responsibility have accounted for more than 60% of all respondents to the surveys. This finding is also consistent with the data presented in the ERIC report.

The salary information obtained from the survey reveals that, on the average, the woman engineer earns less than the average engineer's salary. This information is obtained by comparing data from the SWE survey with data from the 1983 *Professional Income of Engineers,* a survey conducted by the Engineering Manpower Commission of the American Association of Engineering Societies, Inc. (AAES).

Exhibit 7 compares SWE salary data with the median salary and the upper quartile salary from the AAES survey based on number of years since Bachelor's degree. Anyone with less than one year since the Bachelor's degree was included in the "1 year since BS" category. The AAES survey has a "zero year" set of data. Thus, the first-year salaries in the SWE survey are artificially lower as compared with the AAES survey.

The AAES uses the "years since BS" for all of its data, because this tends to blend the data for persons with different degree levels. That is, a person who takes a higher degree will generally start to work at a higher salary than one with a Bachelor's degree. The extra time getting a graduate degree is therefore equivalent to the same amount of work experience time. While this is not universally true, it is accurate enough to use for the SWE survey and gives a good comparison with a survey of more than 150,000 engineers.



SWE SALARY SURVEY COMPARED TO AAES SALARY SURVEY

EXHIBIT 7

AVERAGE SWE SALARY
AAES MEDIAN SALARY
AAES UPPER QUARTILE SALARY

The upper quartile salary from the AAES survey represents the salary level of the top 25% of its survey; that is, 25% of the AAES respondents earn that salary or better. A similar breakdown of information with the SWE survey was not made.

Even though the average woman engineer earns less than the average engineer, women engineers have nearly doubled their salaries during the last decade. The salaries shown below are based on an average for all disciplines and all degree levels:

1974	$15,000
1977	$19,000
1980	$25,000
1982	$28,000
1985	$29,000

Exhibit 8 shows a breakdown of average salary versus years since Bachelor's degree for the top five fields of specialization. Data beyond that shown is not statistically meaningful because of the low number of responses per year per category.

However, the average for all responses for these five categories indicates that chemical engineers are the highest paid. These were followed by computer science, electrical, mechanical, and civil engineers. The difference between the highest and the lowest salary was about $5,000 per year. □

Years Since BS	All $K	All No.	Mechanical $K	Mechanical No.	Chemical $K	Chemical No.	Computer Science $K	Computer Science No.	Civil $K	Civil No.	Electrical $K	Electrical No.
1	25.8	290	26.5	37	26.7	26	27.3	17	22.8	18	27.8	22
2	28.0	185	27.5	32	30.4	16	29.0	10	25.3	16	30.0	15
3	28.7	198	30.0	22	29.7	13	28.3	13	25.4	19	29.3	15
4	32.3	202	30.6	19	32.6	18	31.3	15	27.5	13	33.1	17
5	34.0	180	32.7	12	33.8	23	34.0	15	34.0	15	35.3	14
6	35.1	117	34.6	7	39.3	9	32.3	8	31.6	9	33.8	5
7	34.9	109	36.0	9	38.5	11	33.5	8	32.7	6	33.4	8
8	37.5	91			34.8	18	39.7	8	36.0	7		
9	38.9	66			44.0	15						
10	38.6	76										
11	38.0	53										
12	43.5	40										
13	44.6	35										
14	45.6	44										
15	40.9	30										

AVERAGE SALARY AND NUMBER OF RESPONSES BY YEARS SINCE BS DEGREE

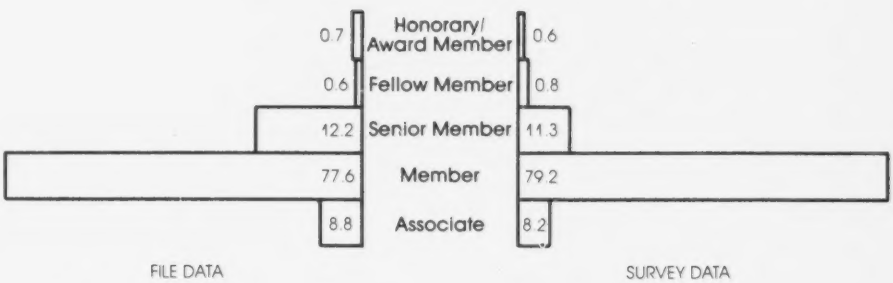
EXHIBIT 8

GENERAL CHARACTERISTICS

MEMBERSHIP GRADE

The membership records of SWE on January 19, 1984, showed that 77.6% of the 4,453 non-student members held the "Member" grade. The response to the survey showed that 79.2% of those responding held the "Member" grade. Respondents showed about the same distribution of memberships as the SWE data base.

A comparison between the SWE data base and the survey is shown in Exhibit 9 for all membership grades. □

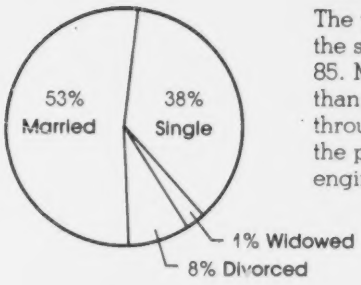


PERCENTAGE IN EACH SWE MEMBERSHIP GRADE

EXHIBIT 9

AGE OF MEMBERS

The youngest woman engineer in the survey was 22 and the oldest was 85. More members are 27 years old than any other age. The ages 22 through 30 years represent 64% of the population of women engineers. □



MARITAL STATUS

EXHIBIT 10

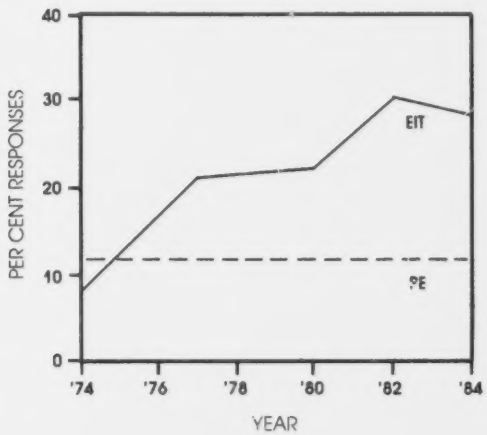
MARITAL STATUS AND CHILDREN

The woman engineer represents a number of lifestyles. (See Exhibit 10.) Of the answers given, 1,185 said they were married and 169 said they were divorced. The typical engineer with children averaged 41 years of age. □

REGISTRATION AND TECHNICAL SOCIETIES

More than half of the women engineers are not registered. The respondents indicated that 40% were registered professional engineers (PE) or engineers-in-training (EIT). The total number with full registration has remained constant at about 12% through the years. However, there is a steady increase in the number of engineers-in-training, as show in Exhibit 11.

Seventy-three percent (73%) of respondents also belong to another technical society. □



PROFESSIONAL REGISTRATION

EXHIBIT 11

GEOGRAPHICAL LOCATION

More respondents (417) live in California than in any other state. Texas, New York, Maine, and Pennsylvania followed with 140, 138, 124, and 95 respondents, respectively. Number of respondents by region is shown in Exhibit 12. □

GEOGRAPHICAL LOCATION

EXHIBIT 12

APPENDIX I

SOCIETY OF WOMEN ENGINEERS
UNITED ENGINEERING CENTER, ROOM 305
345 EAST 47TH STREET
NEW YORK, NEW YORK 10017

SURVEY OF THE WOMAN ENGINEER
CONDUCTED BY
THE STATISTICS COMMITTEE

Membership grade
(check one)

- Fellow ☐
- Senior Member ☐
- Member ☐
- Associate ☐
- Student ☐

This questionnaire is being sent to all members of SWE to obtain information for the bi-ennial SWE publication entitled *A Profile of the Woman Engineer*. You will be assisting the Society, the profession, other women, and yourself by completing the questionnaire and returning it to reach this office by January 3, 1984. Please be assured that this survey is entirely anonymous. It is not necessary to sign your name or otherwise disclose your identity.

I. BASIC INFORMATION

A. PERSONAL INFORMATION

1. Date of Birth ☐☐☐☐ 2. Citizenship ☐ 1-USA ☐ 2-Non-USA 3. Sex 1-Female ☐ 2-Male ☐

4. Marital Status 1-Married ☐ 2-Single ☐ 3-Divorced ☐ 4-Widowed ☐ 5-No. of Children _____

B. ADDITIONAL INFORMATION

1. Are you a member of other technical societies such as ASME, IEEE? 1-Yes ☐ 2-No ☐

   If yes, please list _____

2. List first three digits of your zip code _____

3. Are you registered by a state board of engineering examiners? 1-Yes PE ☐ 2-Yes EIT ☐ 3-No ☐

4. Gross income before taxes including salary, commissions, and bonuses or fees but excluding that part of your income which has no relationship to your work such as bonds, stocks, rents, investments, inheritances, etc. If your income is for less than full-time employment, please indicate equivalent full-time salary. Estimate your income for year ending 12-31-83.

   Salary Range:
   - less than $21,000 per annum ☐
   - $21-$30,999 ☐
   - $31-$39,999 ☐
   - $40-$49,999 ☐
   - $50-$59,999 ☐
   - above $60,000 ☐

II. EMPLOYMENT INFORMATION

A. CURRENT EMPLOYMENT STATUS

1. Full Time:	☐ 1-Engineering Related	☐ 2-Non-engineering Related
2. Part Time: Non-Student	☐ 3-Engineering Related	☐ 4-Non-engineering Related
Student	☐ 5-Engineering Related	☐ 6-Non-engineering Related
3. Unemployed:	☐ 7-Seeking Employment	☐ 8-Not Seeking Employment
	☐ 9-Full-Time Student	☐ 10-Retired

B. IF UNEMPLOYED OR EMPLOYED PART-TIME AND SEEKING EMPLOYMENT, WHAT TYPE OF POSITION ARE YOU SEEKING?

(check one) ☐ 1-Engineering Related ☐ 2-Non-engineering Related
(check one) ☐ 1-Full-Time ☐ 2-Part-Time ☐ 3-Temporary

C. EMPLOYMENT HISTORY

1. Years since Bachelor's Degree	☐☐	5. Years involuntarily unemployed	☐☐
2. Years in further full-time study	☐☐	6. Years unemployed by choice	☐☐
3. Years employed, engineering related	☐☐	7. Years retired	☐☐
4. Years employed, non-engineering related	☐☐		

III. ACADEMIC INFORMATION

A. WHAT IS HIGHEST DEGREE EARNED?

☐ 01 None
☐ 02 Associate
☐ 03 Bachelor
☐ 04 Masters
☐ 05 MBA
☐ 06 Doctorate
☐ 07 Other _ ____ _____

B. FOR EACH DEGREE EARNED GIVE YEAR, DEGREE LEVEL AND CURRICULUM.

(Example: MSEE, 1975 = 75 04 15)

Y D/L C ☐☐☐☐☐☐ Y D/L C ☐☐☐☐☐☐ Y D/L C ☐☐☐☐☐☐ Y D/L C ☐☐☐☐☐☐ Y D/L C ☐☐☐☐☐☐

CURRICULUM/SPECIALIZATION LIST:

01-Aerospace Engineering
02-Agricultural Engineering
03-Architectural Engineering
04-Automation/Control
05-Biochemical Engineering
06-Biomedical Engineering
07-Biology
08-Chemistry
09-Chemical Engineering
10-Civil Engineering
11-Computer Science/Business
12-Computer Science/Engineering
13-Computer Science/Math
14-Education
15-Electrical Engineering
16-Electronics Engineering
17-Engineering (General)
18-Engineering Science
19-Environmental/Sanitary Engineering
20-Geological Engineering
21-Industrial Engineering
22-Management/Business Administration
23-Manufacturing Engineering
24-Mathematics
25-Mechanical Engineering
26-Metallurgical Engineering
27-Mining Engineering
28-Naval Arch/Marine Engineering
29-Nuclear Engineering
30-Petroleum Engineering
31-Physics
32-Systems Engineering
33-Tele-Communications
34-Transportation Engineering
35-Other Engineering (Specify) _____
36-Other Non-engineering (Specify) _____

IV. SPECIALIZATION/RESPONSIBILITY

A. EMPLOYER INFORMATION

1. Field of specialization which best describes your present position (see list above). ☐☐

2. Give the category which is most appropriate for your principal employer in your present position (see list below). ☐☐

01-College or University
02-Consulting
03-Federal Government-Civilian Employee
04-Junior College or Technical Institute
05-Local Government
06-Military Service
07-National Laboratory
08-Nonprofit Organization (other than school)
09-Private Industry or Business
10-Secondary, Elementary or Other School
11-Self-Employed
12-State Government
13-Utilities
14-Other (Specify) _____

3. Give the product(s) or service area(s) which best describe your present employer. ☐☐ ☐☐

01-Agriculture and Food
02-Aircraft/Spacecraft
03-Ceramics
04-Chemicals/Allied Products
05-Computers
06-Computer Software
07-Construction/Civil Engineering
08-Education & Information Service
09-Electrical and Equipment
10-Electronic Equipment
11-Machinery/Mechanical Equipment
12-Metal Fabricated Products
13-Metals (Basic)
14-Mining
15-Motor Vehicles
16-Nuclear
17-Ordnance
18-Petroleum
19-Research
20-Research & Development
21-Technical/Electronic Systems
22-Tele-Communications
23-Utilities
24-Conglomerate
25-Other (Specify) _____

B. WORK RESPONSIBILITY

1. Which area is a major portion of your work related to? ☐☐

01-Aerospace
02-Computers
03-Consumer Products
04-Defense
05-Education
06-Energy
07-Health
08-Industrial Products/Processes
09-Pollution
10-Public Works
11-Robotics
12-Safety
13-Tele-Communications
14-Transportation
15-Urban Development
16-Utilities
17-Other (Specify) _____

2. Which is your principal job function? ☐☐

01-Administration
02-Analysis
03-Consultation
04-Construction
05-Design
06-Development
07-Management
08-Planning
09-Production
10-Research
11-Staff Support
12-Sales and Service
13-Teaching
14-Other (Specify) _____

3. Give other job functions which you perform ☐☐

4. Describe your present supervisory responsibilities ☐☐

01-No regular supervision given
02-Indirect or staff supervision
03-Supervision of team or unit
04-Supervision of project or section
05-Management of major department, division or program
06-General management of organization

5. Number of people regularly supervised.

☐ None ☐ 1 to 5 ☐ 5 to 15 ☐ 15 to 50 ☐ over 50

6. Types of procurement (equipment purchases) you advise or are responsible for in your job. ☐☐

01-Computers
02-Computer peripherals, software packages, supplies
03-Testing and laboratory equipment
04-HV equipment
05-Production and process equipment (e.g. pumps, tanks, heat exchange towers . . .)
06-Construction Supplies (e.g. stones, cement, iron works, metals, pipes . . .)
07-Construction Equipment (e.g. bulldozers, plows . . .)
08-Manufacturing Supplies (e.g. raw materials)
09-Services
10-Other (Specify) _____

7. Give an appropriate figure in annual dollars for costs of procurements $ _____

C. TRAVEL

A. Number of trips made during 1984:

1. Business — give mode of transportation: Air _____ Ground _____
2. Personal — give mode of transportation: Air _____ Ground _____

B. Total miles travelled for both business and personal trips during 1984:

1. Air: ☐ 0-5,999
☐ 6-19,999
☐ 20-39,999
☐ above 40,000

2. Ground: estimate total _____

C. Car Rentals during 1984:

☐ never
☐ 1-5
☐ 6-20
☐ 21 and above

Thank you for your cooperation. Please return the questionnaire to the Society of Women Engineers in the enclosed addressed envelope by **JANUARY 3, 1984.**

CREDITS

This 1984 edition of *A Profile of the Woman Engineer* was written by **Haydée Hetrick**, Statistics Committee Chair, with assistance from **Helen Haskins**, **Lydia Lazurenko**, **Gisela McClellan**, and **Beth Silverman**. Data was compiled by SWE Headquarters staff with assistance from Jeffrey Wootton, a computer service company.

Review was provided by **Peggy Evanich** and **Susan Whatley** of the Executive Committee and by **Julie Gibouleau**, Executive Director.

Production was headed by **Carol Aton**, Publications Committee Chair, with assistance from **Susan Brown**, **Tish Grimes**, and **Jon Thibodeau**.

Additional copies at $10.00 each are available from:

Society of Women Engineers
United Engineering Center, Room 305
345 East 47th St.
New York, NY 10017

Copyright © 1985 by the Society of Women Engineers. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher.